and the horizontal branches would hence soon extend so far and become so bulky, as to render it impossible for the trunk to support them. The principal office here ascribed to the horizontal and spreading branches, is to nourish and support the blossoms and fruit, or seed; little or nothing of the sap being here returned to the parent tree, and hence very feeble powers being wanted in the returning system.

Our author had long entertained an opinion that the ascending fluids in the alburnum and central vessels are everywhere the same, and that the leaf-stalk, the tendril of the vine, the fruit-stalk, and the succulent point of the annual shoot, might in some measure be substituted for each other: experiments have proved his conjecture in many instances to be well founded. In several of these experiments, leaves continued to perform their office when grafted on the fruit-stalk, the tendril, and the succulent shoot of the vine; and the leaf-stalk, the tendril, and the fruit-stalk, equally supplied a branch grafted upon them with nourishment.

On examining the manner in which wounds in trees become covered, an additional proof was found, that the medullary processes, namely, the knobs of wood formed at the junction of a grafted bud, with the stock in which it is inserted, are like every other part of the wood generated by the bark. This is mentioned in contradiction to the opinion still entertained, that the hardest, most durable, and most solid part of the wood, is composed of the soft, cellular, and perishable substance of the medulla. Lastly, some observations are stated, which seem to imply that the sap in its descent may undergo some modification which fits it more effectually to produce wood.

A few remarks on the formation of buds in tuberous rooted plants beneath the ground, are added by way of appendix. These, if the above theory be true, must be formed of matter which has descended from the leaves through the bark. An experiment was made on a potatoe plant by intersecting its runners which connect the tubers with the parent plant, and immersing their ends in a decoction of logwood. In about twenty hours it was found that the decoction had indeed passed along the runners in both directions, but that none had entered the vessels of the parent plant. This result was not unexpected to the author, he being well aware that the matter by which the growing tuber is fed must descend from the leaves through the bark, and that bark cannot absorb coloured infusions.

Inquiries concerning the Nature of a metallic Substance lately sold in London, as a new Metal, under the Title of Palladium. By Richard Chenevix, *Esq. F.R.S. and M.R.I.A.* Read May 12, 1803. [*Phil. Trans.* 1803, *p.* 290.]

In April last, a printed notice was circulated concerning a substance to which the name of Palladium, or new silver, was assigned, and of which samples were offered for sale at Mr. Forster's, in Gerrard Street, Soho. A discovery of such importance did not fail to

excite the curiosity of several mineralogists; and among these, Mr. Chenevix, to whom the manner in which this object was presented to the public appeared suspicious, was among the foremost in procuring a sufficient quantity of the substance to enable him to institute a proper analysis by which the fallacy, if there were any, might be detected. The substance, as exposed to sale, had been worked by art: it had been rolled out in flatting-mills, the largest of the lamina being about three inches in length and half an inch broad, and weighing on an average twenty-five grains each. It had much the appearance of platina; but its specific gravity was so low as from 10·972 to 11·482; that of pure platina in the same state being at least 22. The laminæ were flexible, but not very elastic.

After describing these its physical properties, the author proceeds to a circumstantial account of his chemical analysis, and gives an ample detail of the action, on this metal, of caloric; of simple combustible bodies, such as sulphur and charcoal; of other metals, forming various alloys; of alkalies and acids, in the latter of which he found that the true solvent of palladium was nitro-muriatic acid, which attacked it with great violence, and formed a beautiful solution; and lastly, he mentions the appearance and principal properties of the precipitates from its various solutions. From the results of this investigation we learn, that the vender of this substance was not guilty of misrepresentation when he ascribed to it the following properties:—

1. It dissolves in pure spirit of nitre, and makes a dark red solution.

2. Green vitriol throws it down in the state of a regulus from this solution, as it always does gold from aqua regia.

3. This solution, when evaporated, yields a red calx, that dissolves in spirit of salt or other acids.

4. It is thrown down by mercury and by all the metals except gold, platina, and silver.

5. In a common fire the face of it tarnishes a little, and turns blue; but comes bright again, like other noble metals, on being heated to a greater degree.

6. The greatest heat of a blacksmith's fire will hardly melt it.

7. But if touched while hot with a small bit of sulphur, it runs as easily as zinc.

After maturely considering the results of his experiments, and comparing them with the analogous ones made on the various known metals and combinations of metals, our author acknowledges that he does not find to which of them it may be assimilated. The striking resemblance, however, of several of the precipitates of palladium with that of platina, first led to the suspicion, that if the former be a combination, the latter is no doubt one of its principal ingredients.

The stubborn circumstance of the very low specific gravity appeared one of the most difficult to be surmounted; since an alloy of platina, even with tellurium, the lightest of all metals, would not by calculation give so low a standard.

Reflecting, however, upon the various modifications which substances undergo when in union with each other, and on the variations produced in the laws of affinity by the intervention of new bodies, he was induced to try whether, by the affinity of platina with some other metal easily reduced, and the interference of an intermediate agent, a reduction of both metals might not be brought about, although no such effect could be produced upon each metal when separate. Mercury was thought the most likely to succeed, as being the most reducible; and the intermediate agent adopted was green sulphate of iron. A solution of this sulphate was poured into a salt of platina, and also into a salt of mercury; in neither of which any precipitate took place. The two liquors were then united, and a precipitate, exactly resembling that which is formed by green sulphate of iron in palladium, was instantly formed. This precipitate was collected and exposed to a strong heat, and a metallic substance was obtained, not to be anyways distinguished from palladium.

Thus, after having been baffled in his attempts to discover, by analysis, the component parts of this substance, which he could never bring himself to consider as a new metal, a synthetic process at length led him to the discovery, that the whole pretence was an imposition, and that the substance is, in fact, a combination of platina and mercury; in which the latter, while it marks the most characteristic properties of the former, loses the greater number of its own distinctive qualities.

The singular fact, that an alloy of two metals should be produced, the specific gravity of which is little more than one half of what it ought to be by calculation, is, no doubt, worthy of particular attention; and as quicksilver was in this process brought to a fixed state under circumstances never before observed, a notion might be entertained that the great desideratum in alchemy, the fixation of mercury, was by no means a visionary object. This anomaly of the true and the calculated specific gravities of alloys has been attended to with great caution; and we find the results of the inquiry collected in a table, in which are entered the true and the calculated specific gravities of palladium with seven different metals; and the differences are stated, which vary much more considerably than might have been expected, both in excess and defect, the number representing this difference in the combination with platina being $+2{\cdot}100$, and with tin $-1{\cdot}165$.

Those who cultivate chemistry with any degree of ardour, will be gratified to see in this paper the pains taken by the author, and the various modes he has devised, to produce this compound metal in its most perfect state of combination. Among various other results, it appears that the specific gravities of the alloys vary according to the proportions of the two ingredients in the following manner:—

		Spec. grav.		Spec. grav.		Spec. grav.
Platina	61	11·736	70	13·249	81	15·141
Mercury	39		30		19	

Should this alloy ever be found useful in the arts, or for œconomi-

cal purposes, the author owns that other methods of forming it, besides those here suggested, might be contrived: but the general problem, he says, is to combine, in the most intimate manner possible, the greatest quantity of mercury with a given quantity of platina. And he adds, that the principal difficulty in resolving the problem will be to unite such a portion of mercury that the specific gravity of the compound may not exceed 12; and that it may be soluble in nitric acid.

In the course of this inquiry, many instances have occurred which show how much we have yet to learn concerning the nature of mercury and platina. Of the former, we know that it is perpetually varying; and that certain solutions of it will frequently change their state in a few hours: and as to the latter, we are still more in the dark concerning its principal properties. A considerable part of the present paper is taken up in describing some experiments respecting these metals, from which we learn that platina will combine with oxygen, and form a true oxide; that the affinities of platina differ much from what has generally been stated in the tables; and that, in general, the whole doctrine of chemical affinities still offers a field for much investigation. The affinities of metals, which are here experimentally demonstrated in several instances, will, no doubt, serve to put us upon our guard concerning the admission of new simple metals, which, on close examination, will often, as in the present case of the palladium, turn out to be combinations of so close a nature as not to be easily decomposed. A great obstacle to the discovery of this deception is, no doubt, the little dependence that is to be placed on specific gravities; since, as we have seen above, a contrary anomaly to that which operates upon platina and mercury may take place in other alloys, which in some cases become as much heavier than the mean as the palladium becomes lighter. In a word, the principal task of modern chemists seems to be to simplify and reduce the immense number of supposed elements; and, by a close observation of nature, to learn from what a small store of primitive materials all that we behold and wonder at has been originally created.

An Account of the sinking of the Dutch Frigate Ambuscade, *of* 32 *Guns, near the Great Nore; with the Mode used in recovering her. By Mr.* Joseph Whidbey, *Master Attendant in Sheerness Dock Yard. Communicated by the Right Hon. Sir* Joseph Banks, *Bart. K.B. P.R.S.* Read April 28, 1803. [*Phil. Trans.* 1803, *p.* 321.]

On the 9th of July 1801, this frigate sailed from Sheerness harbour with a strong favourable wind. In about thirty minutes she went down by the head, and in less than four minutes more she sunk entirely, twenty-two of the crew having perished by the fatal accident, which is ascribed to the hawse-holes being extremely large, low, and carelessly left open; so that by the crowd of sail the ship bore, they were pressed under water, by which means she filled imperceptibly, and sunk before any preventive means could be applied.